

Amendments to the Specification

Amend the paragraph beginning on page 13 at line 15 as follows:

Further, the characteristics of the beam emitting from the discharge holes 14a of the beam-emitting electrode 14 greatly differ according to the length of the discharge holes 14a. Hence, the length of the discharge holes 14a must be selected according to the desired use of the beam source. A length of 1-5 times the hole diameter is appropriate for emitting electrons, ions, radicals, neutral particles having a low neutralization rate, and the like, creating a broad beam downstream from the beam-emitting holes. When the hole length is 5-10 times the hole diameter, the beam directivity improves, enabling localized irradiation of radical and electron beams. This length can achieve a neutralization rate for a neutral particle beam of about 30-70%. When the hole length is 10 times or greater that of the diameter, it is possible to obtain a beam of even greater directivity and a neutral particle beam having a neutralization rate of about 70% or greater. In the present embodiment, the thickness of the beam-emitting electrode is 2 millimeters, while the ratio of ~~hole diameter to~~ the length of the beam-emitting holes to the hole diameter is preferably 2 or greater.

Amendments to the Claims

This listing of claims replaces prior versions:

Claim 1 (Currently Amended): A beam source comprising:

a discharge tube;

a gas inlet for introducing gas into the discharge tube disposed on an upstream side of the discharge tube;

three electrodes mounted in the discharge tube downstream from the gas inlet, wherein the upstream electrode has a plurality of openings through which the gas can pass, the middle electrode is a mesh electrode, and the downstream electrode is a beam-emitting electrode having a plurality of beam-emitting holes and is disposed in a plane parallel to the middle electrode;

a plasma chamber formed between the upstream electrode and the mesh electrode, the upstream electrode and the mesh electrode connected by wiring for maintaining at approximately the same potential, and plasma-generating means disposed between the upstream electrode and the mesh electrode on the outside of the discharge tube for transforming gas introduced into the discharge tube into plasma; and

an accelerating chamber formed between the mesh electrode and the downstream electrode, the mesh electrode and the downstream electrode connected by another wiring to voltage-applying device for accelerating the beam between the mesh electrode and the downstream electrode and emitting the accelerated beam from the downstream electrode;

wherein said mesh electrode comprises a cross mesh having a wire thickness and width of 0.1 – 0.5 millimeters and has an open area ratio of 85% or less and an aspect ratio of open areas provided in said mesh electrode is less than 1;

wherein an accelerating voltage of 1 kV or less is applied between the mesh electrode and the downstream electrode, and the two electrodes on the downstream end are separated by a distance of ~~5 millimeters or greater~~ 10-30 millimeters; and

wherein each of the beam-emitting holes formed in the beam-emitting electrode on the downstream end has a length-to-diameter ratio of 2 or greater.

Claims 2-4 (Canceled)

Claim 5 (Previously Presented): A beam source as claimed in claim 1, wherein the voltage-applying device applies a positive-negative pulse-type voltage that alternately irradiates either positive ions and negative ions or positive ions and electrons.

Claims 6-10 (Canceled)

Claim 11 (Previously Presented): A beam source as claimed in claim 1, wherein said beam emitting electrode is set to zero potential.

Claim 12 (Currently Amended): A neutral particle beam source comprising:

a discharge tube;

a gas inlet for introducing gas into the discharge tube disposed on an upstream side of the discharge tube;

three electrodes mounted in the discharge tube downstream from the gas inlet, wherein the upstream electrode has a plurality of openings through which the gas can pass, the middle

electrode is a mesh electrode, and the downstream electrode is a beam-emitting electrode having a plurality of beam-emitting holes and is disposed in a plane parallel to the middle electrode;

a plasma chamber formed between the upstream electrode and the mesh electrode, the upstream electrode and the mesh electrode connected by wiring for maintaining at approximately the same potential, and plasma-generating means disposed between the upstream electrode and the mesh electrode on the outside of the discharge tube for transforming gas introduced into the discharge tube into plasma; and

an accelerating chamber formed between the mesh electrode and the downstream electrode, the mesh electrode and the downstream electrode connected by another wiring to a voltage-applying device for accelerating a beam between the mesh electrode and the downstream electrode and emitting the accelerated beam from the downstream electrode;

said mesh electrode comprises a cross mesh having a wire thickness and width of 0.1-0.5 millimeters and has an open area ratio of 85% or less and an aspect ratio of open areas provided in said mesh electrode is less than 1;

wherein accelerating voltage of 1 kV or less is applied between the mesh electrode and the downstream electrode and the two electrodes on the downstream end are separated by a distance of 10-30 millimeters;

wherein charge exchange takes place in said beam emitting holes formed in the downstream electrode, resulting in an emission of a neutral particle beam, and

wherein each of the beam-emitting holes formed in the beam-emitting electrode on the downstream end has a length-to-diameter ratio of 2 or greater.

Claim 13 (Previously Presented): A neutral particle beam source as claimed in claim 12, wherein the voltage applying device applies a positive and negative pulse-type voltage.

Claim 14 (Currently Amended): A neutral particle beam source as claimed in claim 12, wherein ~~wherein~~ the beam-emitting electrode on the downstream end has the same potential as that of a chamber into which the beam is emitted.

Claim 15-21 (Canceled)

Claim 22 (Previously Presented): A neutral particle beam source as claimed in claim 12, wherein said beam emitting electrode is set to a zero potential.